RESTRICTED CIRCULATION

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AGRICULTURAL MEMORANDUM NO 671

Monthly averages of hours of frost in March, April and May at 6 sites in England and Wales - D Forsdyke.

Computer printouts of frequency tables of hourly values of temperature (at 1°C intervals) and corresponding wind speed (in 10 ranges) were obtained for another investigation. These tables have now been analysed to find the average number of hours per month with temperatures below freezing (at screen level) which occurred in the months of March, April and May. Six widely scattered stations were used, 5 airfields and one, Plymouth, on the coast.

The tables were analysed to find (a) the frequency of occurrence of sub zero temperatures when the wind speed was 3 knots or less, radiation frost, and (b) the frequency of occurrence of sub zero temperature with wind speeds of 4 knots or more, wind frost. This arbitary division into wind and radiation frost was chosen since it seems unlikely that frost protection methods relying on heating, oil burners or wax candles, would be effective at wind speeds of 4 knots or more.

The results are tabulated for each of the 6 stations, arranged in order of decreasing frost frequency. At all stations wind frosts are more frequent than radiation frosts in March and this is particularly marked at Cardiff (Rhoose) where this is also true in April. At the other stations in April and May radiation frosts are generally more frequent than wind frosts.

Since the hourly wind and temperature data needed to produce the frequency tables are only available in a computer data bank for a very limited number of stations in England and Wales an attempt was made to relate the results to a more widely available parameter. As the monthly mean temperature is known for many stations in England and Wales this was calculated from the frequency tables for the 6 stations for the same periods of years used in the frost analysis. Figure one shows the average number of hours per month of occurrence of temperatures below 3 temperature levels plotted against the monthly mean temperature for the corresponding station.

The best fit curves, drawn by eye, are reasonably smooth and it is suggested that these could be used to provide an estimate of the average number of hours per month when temperatures can be expected to be below the given thresholds from knowledge of, or an estimate of, the monthly mean temperature for a site. The fact that the stations used to derive the curves range from one with an extreme coastal exposure, Plymouth, to an inland non urban site, Elmdon, suggest that the results may be representative of most sites.

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FH1

Average number of hours per month when the temperature is less than or equal to the given value.

Birmingham (Elmdon) - 1950-1971

Month	Temperature	(a) Radiation Frost	(b) Wind frost	Total
March	$\leq 0^{\circ}C$	34.7	46.6	81.3
	$\leq -2^{\circ}C$	19.9	12.2	32.1
	$\leq -4^{\circ}C$	8.5	3.0	11.5
	$\leq -6^{\circ}C$	3.2	0.8	4.0
	$\leq -8^{\circ}C$	0.8	0	0.8
April	$\leq 0^{\circ}C$	12.1	7.6	19.5
	$\leq -2^{\circ}C$	3.6	1.4	5.0
	$\leq -4^{\circ}C$	0.8	0	0.8
May	$\leq 0^{\circ}C$	2.0	0.2	2.2
	$\leq -2^{\circ}C$	0	0	0

Manchester (Ringway) - 1949-1971

March	$\leq 0^{\circ}C$	24.0	31.3	55.3
	$\leq -2^{\circ}C$	10.0	7.5	17.5
	$\leq -4^{\circ}C$	2.9	1.8	4.7
	$\leq -6^{\circ}C$	1.0	0.5	1.5
	$\leq -8^{\circ}C$	0.1	0	0.1
April	$\leq 0^{\circ}C$	4.8	4.0	8.8
	$\leq -2^{\circ}C$	0.4	0.3	0.7
May	$\leq 0^{\circ}C$	0.1	0.3	0.4

London Airport (Heathrow) - 1949-1971

March	$\leq 0^{\circ}C$	20.3	30.2	50.5
	$\leq -2^{\circ}C$	8.4	6.7	15.1
	$\leq -4^{\circ}C$	1.7	0.2	1.9
	$\leq -6^{\circ}C$	0.2	0	0.2
April	$\leq 0^{\circ}C$	2.5	2.5	5.0
	$\leq -2^{\circ}C$	0.1	0.1	0.2
May	$\leq 0^{\circ}C$	0	0	0

Cardiff (Rhoose) - 1957-1971

March	$\leq 0^{\circ}C$	8.4	38.0	46.4
	$\leq -2^{\circ}C$	3.3	11.9	15.2
	$\leq -4^{\circ}C$	0.7	3.1	3.8
	$\leq -6^{\circ}C$	0.1	0.8	0.9
April	$\leq 0^{\circ}C$	1.6	6.9	8.5
	$\leq -2^{\circ}C$	0.4	1.0	1.4
May	$\leq 0^{\circ}C$	0.2	0.2	0.4

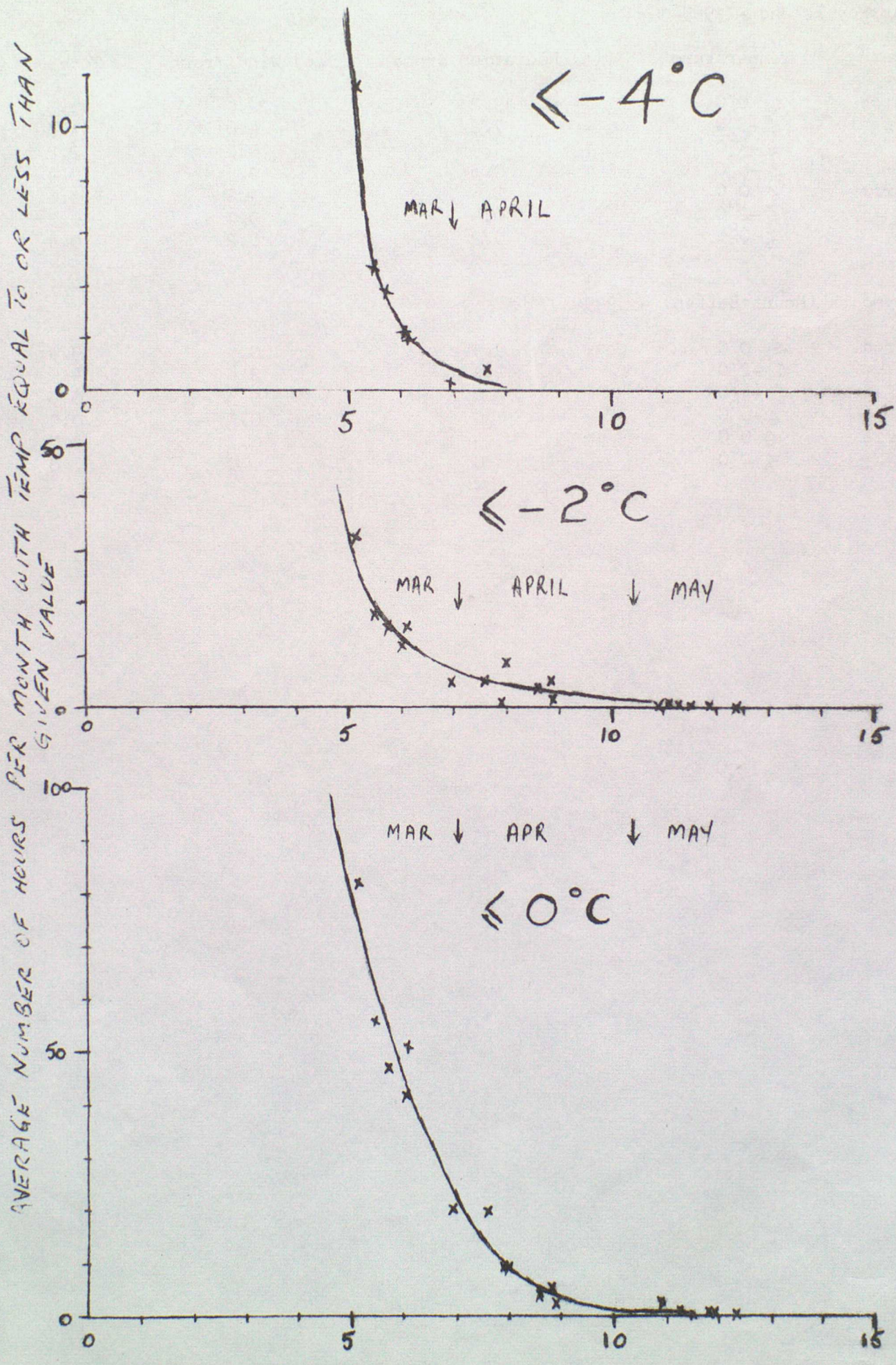
Thorney Island - 1959-1971

Month	Temperature	(a) Radiation frost	(b) Wind frost	Total
March	$\leq 0^{\circ}C$	19.2	22.1	41.3
	$\leq -2^{\circ}C$	7.2	4.6	11.8
	$\leq -4^{\circ}C$	1.4	0.8	2.2
	$\leq -6^{\circ}C$	0.3	0.1	0.4
April	$\leq 0^{\circ}C$	2.6	1.2	3.8
	$\leq -2^{\circ}C$	0.4	0.1	0.5
May	$\leq 0^{\circ}C$	0.2	0.2	0.4

Plymouth (Mount Batten) - 1949-1971

March	$\leq 0^{\circ}C$	9.1	10.8	19.9
	$\leq -2^{\circ}C$	2.1	2.4	4.5
	$\leq -4^{\circ}C$	0	0.3	0.3
	$\leq -6^{\circ}C$	0	0.1	0.1
April	$\leq 0^{\circ}C$	1.0	0.7	1.7
May	$\leq 0^{\circ}C$	0	0	0

FIGURE 1.



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